

intelliHQ

REDI DEVELOPING AUSTRALIA'S
MTP SECTOR
WORKFORCE
Powered by **MTPConnect**

AI in Healthcare Training Program Clinicians and Researchers Training



Delivered in partnership



Learning partner



Overview

Online content

- Self-paced
- 20 x 1 hour sessions
- 21st July- 15th October

Cost \$150 aud

In person weekly workshops

- Brisbane, Sydney, Melbourne, Adelaide
- Virtual attendance supported
- Every Tuesday starting 26th July-4th Oct

Fellows of the Royal Australasian College of Physicians (RACP) can claim 30 hours of CPD credits for this activity in MyCPD.

Course objectives

At the end of the course participants will...

- Understand how big data capture and AI can support their work and improve patient outcomes
- Be fluent in the different types of AI and how they can be applied to healthcare and research
- How to use healthcare data and AI tools to improve patient outcomes
- Use basic coding to query big data and predictive models
- Understanding the foundations of common data analysis approaches for health data

Course highlights

- Overview of data science and AI basics and terminology
- Secondary analysis of electronic health records
- Challenges in health data science
- Data preparation, pre-processing,
- Australian regulation and policies on AI in health and research
- Ethical implementation of AI
- Fairness and algorithm disparity and bias
- Sensitivity Analysis and Model Validation

Featured speakers

- Dr Leo Celi - Clinical Research Director, Laboratory of Computational Physiology, *Massachusetts Institute of Technology*
- Prof John D. Halamka - Professor of Medicine, Harvard Medical School Chief Information Officer, Beth Israel Deaconess Medical Center
- Dr Kiri Wagstaff - Principal Researcher, NASA
- Dr Allan Walkey MD. - Professor of Medicine, School of Medicine, Boston University Co-Director, Evans Center for Implementation & Improvement Sciences, Boston University

In-person Workshops

Location: Brisbane, Sydney, Melbourne, Adelaide with dial-in options across other states.

Take the opportunity to learn with your peers at these exciting in-person weekly workshops.

26th July-4th October 2022

Date/time	Workshop title	Description	Expert facilitation
<p>Tuesday 26th July 5.30-7.00 pm</p>	<p>Course Introduction and Orientation</p>	<p>This workshop will be an introductory workshop with the course creator A/Prof Leo Anthony Celi, Clinical Research Director, who will set the scene for participants and answer questions from the participants about the syllabus. Participants will also get a chance to meet each other and network.</p>	<p>Dr Shane Nanayakkara, Cardiology fellow at the Alfred Hospital Researcher, Baker Heart and Diabetes Institute</p>
<p>Tuesday 2nd Aug 5:30-7:00 pm</p>	<p>Big data and AI in Healthcare and Research: Identifying challenges & formulating the Research question</p>	<p>Participants will be presented with case studies where AI has been developed for healthcare and life sciences research. Examples of failures and successes will be given and the reason for the outcomes discussed. The aim is for participants to understand the possibilities and pitfalls of developing and implementing big data capture, analytics and AI.</p>	<p>Dr Kelvin Ross, CTO Datarwe</p>
<p>Tuesday 9th Aug 5:30-7:00pm</p>	<p>Defining the Patient Cohort and Big data analytics pt 1</p>	<p>Participants will work on a real world big data set to determine how to define a patient cohort for a real word use case example. This workshop participants will perform:</p> <ul style="list-style-type: none"> • Defining the Patient Cohort • Data Preparation • Data Pre-processing • Missing Data • Noise Versus Outliers 	

<p>Tuesday 16th Aug 5:30-7:00pm</p>	<p>Big data analytics pt 2</p>	<p>Participants will work on a real- world big data set to determine how to define a patient cohort for a real word use case example. This workshop participants will perform:</p> <ul style="list-style-type: none"> • Exploratory Data Analysis • Linear Regression • Additional Data Analysis Methods 	<p>Dr Ping Zhang, Data Scientist and bioinformatician at Menzies Health Institute Queensland (MHIQ), Griffith University</p>
<p>Tuesday 23rd Aug 5.30-7.00 pm</p>	<p>Tools for Data Science and Modelling</p>	<p>Participants will begin to apply their data to models:</p> <ul style="list-style-type: none"> • Casual Inference • Tools for Data Science • Exploratory Data Analysis • Regression Models • Predictive Models • Fairness and Bias 	<p>TBA</p>
<p>Tuesday 30th Aug 5:30-7:00 pm</p>	<p>Introduction to deep learning 1</p>	<p>Participants will gain an understanding of:</p> <ul style="list-style-type: none"> • What is deep learning? • Deep generative modelling • Deep computer vision • Deep sequence modelling 	<p>TBA</p>
<p>Tuesday 6th Sep 5:30-7:00pm</p>	<p>Introduction to deep learning 2</p>	<p>Participants will work through:</p> <ul style="list-style-type: none"> • What kind of data do you need for deep learning? • How can/is it used to solve healthcare challenges? • What are the limitations 	<p>TBA</p>
<p>Tuesday 13th Sep 5:30-7:00pm</p>	<p>Building a Brain</p>	<p>The goals of this exercise include:</p> <ul style="list-style-type: none"> • Exploring how neural networks use data to learn • Understanding the math behind a neuron 	<p>NVIDIA</p>

<p>Tuesday 20th Sep 5:30-7:00pm</p>	<p>Ethical Implementation of AI</p>	<p>Participants will work through their real-world problem and data set to consider how algorithm disparity / bias might occur given the data set they are working with and how this might impact the patient or use case</p>	<p>Dr Catriona Wallace, Executive Director, The Gradient Institute</p>
<p>Tuesday 27th Sep 5.30-7.00 pm</p>	<p>Looking to the future steps: Building databases</p>	<p>Participants will work through how to build databases of the future that support the development of quality AI tools</p>	
<p>Tuesday 4th Oct 5:30-7:00 pm</p>	<p>Course summary, gaps and continuation of education and training</p>	<p>In this workshop, participants will work through a self-assessment questionnaire, discuss gaps in their knowledge and learn about options for continuing education and training.</p>	<p>TBA</p>

Total hours in-person/live virtual workshops: 16.5

Online content

To complete between 21st July - 15th October 2022

Self-paced learning time allocated (approx)	Course title	Learning objectives	Presenters
1 hr	Course Introduction	Course creator and esteemed Principal Research Scientist from MIT will provide an introduction to AI for Healthcare setting the scene and inspiring course participants on the importance and potential impact of implementing big data analytics and AI technology in the Australian healthcare system.	A/Prof Leo Anthony Celi, Clinical Research Director, MIT ; Physician, Beth Israel Deaconess Medical Center ; A/Prof Medicine, Harvard Medical School
1 hr	Setting the stage: What is Data Science	The key ingredients for successful collaboration in data science The evaluation of machine learning systems using an example from radio astronomy	Dr Kiri Wagstaff, Principal Researcher, NASA
1 hr	A Data Science Revolution in Healthcare	<ul style="list-style-type: none"> • Prerequisites of successful data science • Technologies that improve machine learning and data analysis in health care • Current limitations in machine learning • How Machine intelligence and Machine Learning can be defined • ML techniques e.g. Deep learning • The impact of high-quality data collection in health care on research and individual patients • Dr Donny Cheung • Google Cloud • Healthcare & Life SciencesThe opportunities of evidence-based medicine based on data-driven techniques 	Dr Donny Cheung Google Cloud Healthcare & Life Sciences

<p>1 hr</p>	<p>Secondary Analysis of Electronic Health Records</p> <p>Presentation: The Prerequisite for High-Quality Data Analytics</p>	<ul style="list-style-type: none"> • The function and individual characteristics of electronic health records and registries • The progression of databases and their usage • SQL as an example of a query language and some basic commands • The MIMIC III Database, its structure and other important databases for critical care research • The challenge of interpreting heterogeneous data 	<p>Prof John D. Halamka Professor of Medicine, Harvard Medical School; Chief Information Officer, Beth Israel Deaconess Medical Center</p>
<p>1 hr</p>	<p>Challenges in Health Data Science</p>	<ul style="list-style-type: none"> • Statistical hypothesis testing – the null hypothesis and p values • The false Discovery Rate and the Familywise Error rate • The Reproducibility crisis and methods to increase reproducibility • Benefits of large datasets • The importance of ethical considerations • Limitations of RCT 	<p>Dr Patrick Kimes Postdoctoral Research Fellow Harvard University</p> <p>William Boag PhD Student MIT</p> <p>Dr Omar Badawi Senior Scientist Philips Healthcare</p>
<p>1 hr</p>	<p>Data Science Cookbook: Formulating The Research Question</p>	<p>Understand how to turn a clinical question into a research question.</p> <ul style="list-style-type: none"> • Principles of choosing a sample. • Approaches and potential pitfalls. • Principles of defining the exposure of interest. • Principles of defining the outcomes. • Selecting an appropriate study design 	<p>Dr Allan Walkey, MD School of Medicine, Boston University</p> <p>Dr Omar Badawi, Director of Medical Device Safety NESTcc; Research Affiliate, MIT</p>
<p>1 hr</p>	<p>Defining the Patient Cohort</p>	<ul style="list-style-type: none"> • Understand the process of cohort selection using large, retrospective databases • Learn about additional specific skills in cohort building including data visualisation and natural language processing (NLP). 	<p>Dr Alistair Johnson, Research Scientist, MIT</p>

<p>1 hr</p>	<p>Data Preparation</p>	<ul style="list-style-type: none"> • What kind of Medical Data can be usually found in databases and how should it be interpreted and handled? • What are sources of bias in Medical Data and how can we account for them? • What should we take note of when trying to collaborate with professionals of other fields of science? • How can we ensure that our study is reproducible? Why is reproducibility important? • What is a Relational Database? • How can I query medical databases? 	<p>Dr Kiri Wagstaff, Principal Researcher, NASA</p> <p>Dr Alistair Johnson, Research Scientist, MIT</p>
<p>1 hr</p>	<p>Data Pre-processing</p>	<ul style="list-style-type: none"> • Understand the requirements for a “clean” database that is “tidy” and ready for use in statistical analysis. • Understand the steps of cleaning raw data, integrating data, reducing and reshaping data. • Be able to apply basic techniques for dealing with common problems with raw data including missing data, inconsistent data, and data from multiple sources. 	<p>Dr Jesse Raffa, Research Scientist, MIT</p> <p>Dr Marta Fernandes, Researcher, Massachusetts General Hospital</p> <p>Dr Miguel Armengol, Head of the Big Data Department, Regional Ministry of Health of Southern Spain</p>
<p>1 hr</p>	<p>Missing Data</p>	<ul style="list-style-type: none"> • What are the different types of missing data, and the sources for missing-ness. • What options are available for dealing with missing data. • What techniques exist to help choose the most appropriate technique for a specific dataset 	<p>Dr Jesse Raffa, Research Scientist, MIT</p>

<p>1 hr</p>	<p>Noise Versus Outliers</p>	<ul style="list-style-type: none"> • What common methods for outlier detection are available. • How to choose the most appropriate methods. • How to assess the performance of an outlier detection method and how to compare different methods. 	<p>Dr Jesse Raffa, Research Scientist, MIT</p>
<p>1 hr</p>	<p>Exploratory Data Analysis</p>	<ul style="list-style-type: none"> • Graphical or non-graphical methods • Univariate (only one variable, exposure or outcome) or multivariate (several exposure variables alone or with an outcome variable) methods. 	<p>Dr Jesse Raffa, Research Scientist, MIT</p>
<p>1 hr</p>	<p>Linear Regression</p>	<ul style="list-style-type: none"> • Identifying data types and how to define study objectives for choosing an appropriate analysis technique. • Be able to carry out one of most common and simplest data analysis methods for health data. • Present and interpret the results from linear regression models. 	<p>Dr Ned McCague, Senior Director Analytics, Markford</p> <p>Dr Jesse Raffa, Research Scientist, MIT</p>
<p>1 hr</p>	<p>Additional Data Analysis Methods</p>	<ul style="list-style-type: none"> • Understanding the foundations of other common data analysis approaches for health data. • Present and interpret the results of these analysis types 	<p>Dr Jesse Raffa, Research Scientist, MIT</p> <p>Dr Alistair Johnson, Research Scientist, MIT</p>
<p>1 hr</p>	<p>Sensitivity Analysis and Model Validation</p>	<ul style="list-style-type: none"> • Appreciate that all models possess inherent limitations for generalizability. • Understand the assumptions for making causal inferences from available data. • Check model fit and performance 	<p>Lawrence Baker, Assistant Policy Researcher, RAND</p>

<p>1 hr</p>	<p>Causal Inference</p>	<ul style="list-style-type: none"> • Introduction to causality and various related terms • Assumptions necessary for proving causality • Confounding and the ways of handling it • Modelling approaches for proving causal inference and the steps involved • The approach of Inverse Probability Treatment Weighting (IPTW) and its application in Marginal Structural Model (MSM) • An example with MIMIC-III 	<p>Amber Nigam, Data Science Coach, Harvard University</p> <p>Pragati Jaiswal, Research Assistant, Harvard</p>
<p>1 hr</p>	<p>Ethical Implementation of AI: Fairness and Algorithm Disparity / Bias</p>	<ul style="list-style-type: none"> • ·What concerns exist around fairness and bias in big data analytics and AI implementation? • ·What has gone wrong in the past? • What can we put in place to ensure this doesn't happen in the future? 	<p>A/Prof Leo Anthony Celi, Clinical Research Director, MIT</p>
<p>1 hr</p>	<p>Implementation Science</p>	<ul style="list-style-type: none"> • ·Successful implementation of AI tools in healthcare is very low, what hasn't worked in the past • ·How to implement algorithms into the clinical workflow • Validation and calibration to your patient cohort 	<p>TBA</p>
<p>1 hr</p>	<p>Future steps: Building databases</p>	<ul style="list-style-type: none"> • Looking forward, how do we build comprehensive, aligned data-bases that support the translation of AI tools across healthcare facilities 	<p>A/Prof Leo Anthony Celi, Clinical Research Director, MIT</p>
<p>1 hr</p>	<p>Conclusion</p>	<p>Closing Summary and Next Steps for Independent Learning</p>	<p>A/Prof Leo Anthony Celi, Clinical Research Director, MIT</p>

Total hours: 20